

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Office Action dated **April 7, 2003** (U.S. Patent Office Paper No. 8). In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Claims 1 to 19 are currently pending in this application. As outlined above, claims 1, 2, 3, 4, 5 and 9 are being amended to correct formal errors and to more particularly point out and distinctly claim the subject invention. Further, the Title and the Abstract are being replaced to correct formal errors and to better disclose and describe the features of the present invention, as claimed. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Objection to the Title

In section 4, page 3 of the Office Action, the Title of the Invention was objected to as being non-descriptive. The Applicants wish to thank the Examiner for his suggestion regarding the title. The title of the application has been amended.

The Examiner is respectfully asked to acknowledge the new Title of the Invention, as outlined in this response.

Objection to the Abstract

In section 2, pages 2 through 3 of the Office Action, the Examiner formulated objections regarding the Abstract. The Abstract has been corrected as required. The Examiner is respectfully asked to acknowledge the replacement Abstract of the Specification.

Claim Objections

In section 5, page 3 of the Office Action, claims 1 and 3 were objected to due to informalities. The required corrections have been made, as can be seen in the amended version of claims 1 and 3.

In section 6, page 3 of the Office Action, claim 4 was objected to due to informalities. Applicants have amended claim 4 to correct the informalities outlined by the Examiner.

In section 7, page 3 of the Office Action, claims 9, 10 and 19 were objected to under 37 CFR 1.75(c), as being improperly dependent claims, due to failing to further limit the subject matter of a previous claim.

Applicants have amended claim 9 accordingly. Claim 10 depends from and adds further limitations to the subject matter claimed by claim 9, in its amended form.

Applicants have amended claim 2. Claim 19 depends from and adds further limitations to the subject matter claimed by claim 2, in its amended form.

Based on the above, the Examiner is respectfully asked to withdraw the objection regarding claims 9, 10 and 19.

Rejections under 35 U.S.C. § 112

In section 9, page 4 of the Office Action, claims 9, 10 and 19 stand rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as their invention.

As mentioned above, claim 9 has been amended. As for claims 10 and 19 their respective parent independent claims (9 and 2) have been amended. Therefore, the object of this rejection has been rendered moot. Applicants respectfully ask the Examiner to acknowledge that the rejection regarding claim 9, 10 and 19 has been overcome.

In section 9, page 4, of the Office Action, claim 9 was rejected under 35 U.S.C. §112 second paragraph, due to insufficient antecedent basis for the term “the abrasive grains”, line 2. Claim 9 has been amended. Applicants believe that claim 9, in its amended form, complies with the formal requirements.

In section 11, page 4, claim 10 was rejected due to its dependency on a rejected claim 9. The deficiency of claim 9 has been cured by amendment as indicated in the above paragraph. Implicitly, Applicants believe that the deficiency of claim 10 has been cured due to the amendment of claim 9.

Rejections under 35 U.S.C. § 102

In section 13, page 4 of the Office Action, claim 1 stands rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Bajaj *et al.*, U.S. Patent 6,204,169 B1 (the '169 patent).

The Examiner alleges in the same section of the Office Action that the '169 patent discloses in column 1, lines 26 through 67 a method of manufacturing a semiconductor device wherein for a substrate as a workpiece in which an insulation film 255 is formed on the substrate, openings are formed in the insulation film 255, a first conductive film 256 is formed in the inside of the openings and on the surface of the insulation film and a second conductive film 258 is formed on the first conductive film 256, by planarizing the second conductive film 258 and part of the first conductive film 256 using a fixed abrasive tool. The Examiner alleges that FIG. 4 of the '169 patent discloses the first and the second planarized conductive films that are formed in the openings. The Examiner alleges that the Abstract of the '169 patent discloses the method comprising: supplying a first processing liquid (slurry) upon planarization of the second conductive film 258 and switching the supply of the liquid from the first processing liquid to a second processing liquid upon planarization of the second and the first conductive film.

Independent claim 1, in its amended form, discloses method steps that are not contemplated by the sections of '169 patent that are pointed out by the Examiner nor by the reference as a whole. The method recited by claim 1 comprises the steps of "supplying a first processing liquid including about 30% oxidizing agent", "planarizing the surface of the second conductive film with the first processing liquid and said fixed abrasive tool", "switching the supply of the liquid from the first processing liquid to a second processing liquid including about 5% oxidizing agent", "planarizing the surface of the second and the first conductive film with the second processing liquid and said fixed abrasive tool", and "wherein a plurality of planarizing steps are constituted in a single planarizing step".

Applicants thoroughly and attentively reviewed the '169 patent and cannot find the above referenced limitations alleged to be contemplated in the reference.

The invention recited by claim 1 is characterized by the fact that the first liquid for planarizing the surface of the second conductive film (a copper film) includes about 30% oxidizing agent, and the second liquid for planarizing the surface of the second conductive film and the first conductive film (a barrier film) includes about 5% oxidizing agent. These particular features disclosed by claim 1 are not contemplated by the '169 reference.

Claim 1 further contemplates the feature of polishing rates pertaining to each of two planarizing steps being changed (see page 4, lines 18 through 21 of the specification). The two planarizing steps can be consolidated into a single planarizing step. This way the yielding rate can be improved. This particular feature of claim 1 is neither disclosed nor suggested by the '169 reference.

Taking into account all the arguments from above, the Applicants respectfully ask the Examiner to withdraw the anticipation rejection regarding claim 1.

In section 9, page 5, of the Office Action, claim 1 stands rejected under 35 U.S.C. §102(e) as allegedly being anticipated by Mravic *et al.*, U.S. Patent 6,083,840 A (the '840 reference).

The Examiner alleges that the '840 reference discloses in columns 4, lines 46 through 67 a method for manufacturing a semiconductor device wherein for a substrate as a workpiece in which an insulation film 10 is formed on the substrate, openings are formed in the insulation film, a first conductive film 15 is formed in the inside of the openings and on the surface of the insulation film 10, and a second conductive film 18 is formed on the first conductive film 15, by planarizing the second conductive film 18 and part of the first conductive film 15 using a fixed abrasive tool, the first and the second planarized conductive films are formed in the openings, said method comprising: supplying a first processing liquid upon planarization of the second conductive film 18 and switching the supply of the liquid from the first processing liquid to a second processing liquid upon planarization of the second and the first conductive films. The Examiner also alleges that the '840 reference discloses in columns 5 through 8, the first and the second processing liquids that contain an oxidizing agent (from 0.5 – 50% hydrogen peroxide), an organic acid (from 0.1 – 0.2 % malic acid), a corrosion inhibitor (from 0.1 – 0.4%

benzotriazole) and water. The Examiner refers to tables 1 – 3 as to show that the concentration of the oxidizing agent is different between the first and the second processing liquids.

The '840 reference, that constitutes the basis for the 35 U.S.C. 102(e) rejection, actually discloses that polishing liquids, such as Bulk Copper Polishing Slurry & Cu/Ta/SiO₂ slurry are changed in accordance with the polished layer. (see the '840 reference, col. 3, lines 7 – 39). The concentrations illustrated in tables 1 - 3 for the above mentioned polishing components are different from the ones claimed by claim 1.

The concentrations for the oxidizing agents for the polishing liquids disclosed by the '840 reference are different from the ones disclosed by the present invention.

Furthermore, the '840 reference does not disclose the concept that a plurality of CMP steps is consolidated in a single CMP step, as claimed by claim 1.

Applicants believe that the above differences between the '840 reference and the claimed subject matter of claim 1 are sufficient to render moot the Examiners allegation that claim 1 might be anticipated by the '840 reference. Therefore, Applicants respectfully ask the Examiner to withdraw the rejection regarding claim 1.

Rejections under 35 U.S.C. § 103

In section 17, page 7 of the Office Action, claims 2-11 and 17-19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mravic *et al.* (the '840 reference) in view of Harada *et al.*, U.S. Patent 6,476,491 B2 (the '491 reference).

The Examiner states that "Mravic *et al.* is applied as above but lacks anticipation on disclosing a tool dressing process wherein a surface of a fixed abrasive tool is dressed using a height adjustable diamond dresser before planarization of the second and the first conductive film".

Applicants have responded above to the Examiner's allegation that claim 1 is unpatentable over the same arguments in view of the '840 reference.

Claims 2, 4, 5, 6, 7, 8, 9, 10, 11, 17, and 19 depend from and add features to an independent claim 1. As mentioned above, since the Examiner's allegations about the

unpatentability over the same arguments in view of the '840 reference have been rendered moot, claims 4, 5, 6, 7, 8, 9, and 10 are therefore patentable over the same reference.

Regarding claims 3 and 18, the arguments already expressed in connection with claim 1 apply.

As already mentioned above, the '840 reference does not disclose the feature of amended claim 3 "thereby a plurality of planarizing steps are constituted in a single planarizing step."

Applicants attentively reviewed the Harada reference and have not found any disclosure in the reference about "a first liquid including about 30% oxidizing agent" and "a second processing liquid including about 5% oxidizing agent" as described by both claims 1 and 3 of the present application.

Therefore, the references that constitute the basis of the 103 rejection, either singly or in combination, do not disclose all the features contemplated by claims 1 and 3. Therefore, Applicants would like to respectfully ask the Examiner to withdraw the obviousness rejection regarding these independent claims and their dependent claims.

CONCLUSION

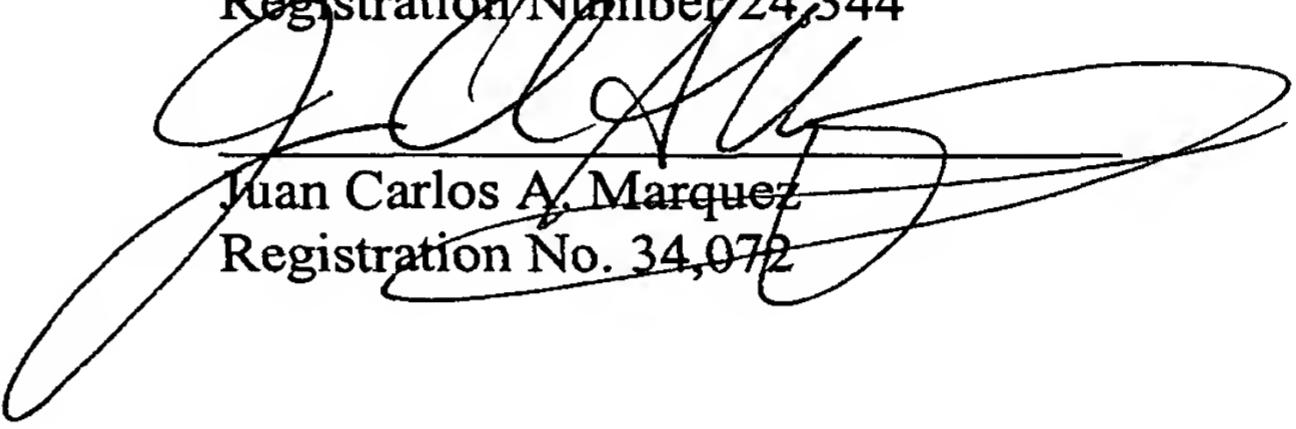
In view of all the above, Applicants respectfully submit that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and

allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and phone number indicated below.

Respectfully submitted,

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